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Macroeconomic effect and risk-taking behavior in a dual banking system

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Abstract

This study aims to analyze the relationship between macroeconomic factors and risk-taking behavior in a dual banking system. Adopting a panel cointegration approach, this research posits macroeconomic factors as exogenous variables and risk-taking behavior as endogenous variables. With having 468 quarterly-observations consisting of 18 banks in Indonesia during 2010-Q4 to 2017-Q1, it finds that the risk-taking behavior of the banks has a long-term relationship with macroeconomic factors. Moreover, conventional bank has long-term relationship to macroeconomic nonetheless it results inversely to Islamic bank. In terms of bank-specified characteristics, bank size and equity to asset ratio are substantial factors for the banks' risk mitigation.

Introduction

In the last couple decades, Indonesia has experienced a dynamic economy, especially when the Asian and global crises occurred. The Asian Crisis also heavily affected several countries such as Malaysia, Thailand and South Korea. As a result, in 1997 those countries suffered economic turmoil, for instance in Indonesia whereby the Growth Domestic Product (GPD) declined by 13%, there was double digit inflation, and currency exchange rate slumped against the U.S. dollar after the government decided to instate a free floating currency exchange rate (Kutan, Muradoglu, & Sudjana, 2012). With this unstable economic condition, the Indonesian government liquidated 16 banks during the crisis. In the year 2008, the subprime mortgage crisis in the U.S. triggered a global crisis, influencing the world economy due to the systematic risk that affected the banking system (Aysun, 2016). However, the contagion effect from that situation mostly happened in European Countries having intense economic ties with the U.S.

A crisis which leads the financial institution to become bankrupt does not only ensue in a conventional system but also in Islamic financial systems (Bourkhis & Nabi, 2013). It has been verified that Islamic financial institutions are not immune. An example of this is in Turkey during the 2000-2001 period when Ihlas Finance House (IFH), as a special Islamic bank to finance the housing sector, was declared bankrupt (Kanten & Ulker, 2013). In that period Turkey, who applied a dual banking system, experienced a financial crisis where the GDP dropped, the inflation was high, and the lira weakened. The macroeconomic condition directly influenced the banking system, including IFH. In terms of internal factors, IFH had management and governance problem that worsened its performance. Both factors mentioned above became the main cause of the bankruptcy of IFH (Ali, 2007).

The interconnectivity of crisis and financial distress in the last two decades serves as evidence that macroeconomic factors hold a pivotal role in financial institution sustainability especially in the banking sector. Macroeconomic factors may stimulate the performance of banks but they may aggravate financial performance during certain unstable situations. In history of economic crises, macroeconomic variables will directly relate to banking performance either in the single banking system or dual banking system (Lin, Farhani, & Koo, 2016). Shingjergji (2013), who investigated the main macroeconomic variables in the Albanian banking, finds that there is a positive and significant relationship between interest rate and credit risk. This confirms previous studies Castro (2013), Farhan et al. (2012), and Ahmad & Bashir (2013), which indicate that interest rate affects the amount of bad debt in the case of floating interest rate. Therefore, the increase in the debt is caused by the increase in payment of interest rates and results in the rise of non-performing loans. The above arguments were drawn from research in conventional banking.

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Klein (2013) in his research studied the non-performing loans (NPLs) in parts of Europe for the period of 1998–2011. He found that the level of loan default was accredited to both macroeconomic circumstances and banks' specific factors. However, the latter set of factors was found to have a comparatively low descriptive power. With respect to inflation rate, when it is high, customers find it difficult to pay their existing loans because of the rising cost of capital, leading to a positive relationship between inflation rate and non-performing loan. Moreover, the significant relationship between inflation and the banks' performance points to a strong relationship to the real economy (Hajer Zarrouk, Ben Jedidia, & Moualhi, 2016).

Espinoza and Prasad (2010) show that NPL increases during periods of low growth. These empirical results support the view that both macro-factors and bank-specific characteristics determine the level of non-performing loans. In particular, they find strong evidence of a significant inverse relationship between real GDP and non-performing loans (Ranjan & Dhal, 2003). Eichler and Sobański (2016) demonstrated the impact of macroeconomic factors on bankruptcy risk of Eurozone banks. They found that lower economic growth leads to higher bankruptcy risk since in recession periods, bankruptcy rates increase substantially.

Moreover, the exchange rate channel points to the effects that monetary policy may have on capital flows and exchange rates, and therefore on foreign borrowing. A change in exchange rate will influence developments in financial stability as well (Karim, Al-Habshi, & Abduh, 2016). Seeberg (2015) explains that for open economies, a monetary policy tightening can attract excessive capital flows, leading to an appreciation of the exchange rate and thereby excessive borrowing in foreign currency. This may cause the financial system to become more vulnerable, as both national and international shocks may erode the repayment capacity of financial intuitions. Thus the exchange rate channel of monetary policy may increase the risk of financial instability.

Ghosh (2016) explains that macroeconomic variables will affect credit risk in a dual banking system in which Islamic banks tend to have counter-cyclical performance growth. This situation delineates that the Islamic bank will have less credit when the economy's growth increases. Referring to findings of different researchers, conventional banks has a negative relationship to economic growth in Organization of Islamic Conference (OIC) countries, while Islamic banks do not have any significant relationship because the size of Islamic banks remains small (Louhichi & Boujelbene, 2016). Research indicates that Islamic banks do not contribute to economic growth yet, and anything that may happen in terms of economic growth factors will not affect Islamic bank risk-taking behavior.

Furthermore, in Islamic banking research, the results show a different impact. For instance, Al Wesabi and Ahmad (2013) notice that interest rate is not statistically significant, but Adebola et al. (2011), who investigate Islamic banking sector in Malaysia, indicate the interest rate has a significant and positive impact related to credit risk. An increase in interest rates causes a heavy load on debtors' cash flow, which triggers loan payment delinquency or an increase of NPLs. This is supported by several studies (Gremi, 2013; Khemraj & Pasha, 2009; Farhan et al., 2012; Warue, 2013) which found that the interest rate has a strong positive relationship to the bank's NPL ratio. Interest rates and direct costs of borrowing are key factors that impact on the solvency of individuals and constitute the direct cost of borrowing. An increase in interest rates means higher loan installments to be paid and more opportunities for borrowers to have difficulty in paying their loans.

The unique characteristics of the bank also determine its performance (Sanwari & Zakaria, 2013). In terms of the size of a bank, it can be judged from the total assets of the bank. Banks with large assets possess the possibility to provide large amounts of credit. The greater the volume of credit provides an opportunity for the bank to reduce the level of spreads, which in turn will lower the level of lending rates (interest rate credit) so that banks will be more competitive in providing services to clients who need credit (Trad, Trabelsi, & Goux, 2017). The size of the company, according to Ranjan and Dhal (2003), will affect its ability to bear risks that may arise due to a variety of situations faced by companies associated with its operations. In addition to that, several studies conducted by Louhichi and Boujelbene (2016), Xiong, Ibbotson, Idzorek, and Chen (2010), and Megginson (2005) also suggest a negative relationship between these two variables of bank size and risk-taking behavior.

A firm with a higher ratio of equity capital, however, shows a negative and significant result for banks. Banks with higher equity on hand tend to have more prudent risk-taking behavior and thus, have lower loan-loss reserve, as stated by various researchers (Saurina Salas, Jimenez, & Lopez, 2007 and Berger, Klapper, & Turk-Ariss, 2009). Suhaila and Wan Mahmood (2008) conducted a study on the bankruptcy risk and capital structure revealed that higher levels of long-term debt will result in more reduction in the optimal use of short-term debt and higher levels of liquid asset holding. The results also show that there was a negative relation between bankruptcy risk and level of capital.

From the Indonesian viewpoint, the macroeconomic effect may lead to more complicated repercussions in regards to the dual banking system that is currently being applied. To capture risk taking behavior in a dual banking system comprehensively and obtain the new perspective of the relationship between risk-taking behavior and macroeconomics factors', this study aims to investigate that relationship in the long-term perspective to fully capture the future situation. This paper will firstly present a introduction and the methodology. This will be followed by the results and discussion, and finally the conclusion and policy recommendations will be presented.

Research Method

This study evaluates eighteen banks in Indonesia, consisting of nine conventional banks and nine Islamic banks in Indonesia, whereby each Islamic bank utilized in this research for the sample of the study was previously an Islamic banking unit in a conventional bank. Indonesia is chosen as the medium of the study due to its unique characteristic of having a dual banking system. Moreover, Indonesia is one of leading countries in the Islamic banking industry as well as having numerous Islamic banking accounts (Ernst and Young, 2016). The data covers a six-year period based on quarterly data from 2010-Q4 to 2017-Q1. The year of 2010 was selected as the beginning of the retrieved data due to the fact that most Islamic banks were established during that year in Indonesia (OJK, 2015). At that time, many conventional banks released their Islamic banking units as fully-fledged Islamic bank. The data was collected from the central bureau of statistics and the central bank of Indonesia website, and it is supported from individual banking reports. Overall, the sample consists of 468 quarterly-observations.

Table 1. Research Variables

Variable	Measurement
NPLF	The ratio of non-performing loan or financing to total loan or financing on a quarterly basis
Z-score	The mean return on assets plus the capital ratio divided by the standard deviation of asset return
BI_Rate	The number of BI Rate at the end of each quarter
Inf	The number of inflation rate at the end of each quarter
Ln_GDP	The log of GDP's number on a quarterly basis
ER	The number of exchange rate at the end of each quarter
Ln_size	The log of the bank size based on a quarterly basis
ETA	The equity to asset ratio of the bank based on a quarterly basis

Based on previous studies, this research employs several variables to measure the long-term relationship between macroeconomics variables and risk-taking behavior. This research will employ panel data analysis and posit risk-taking behavior as the dependent variable. To proxy the risk as a dependent variable, this research has two models, which are:

$$\mathrm{NPLF}_{it} = \beta_0 + \beta_i \mathrm{BI\_Rate}_{it} + \beta_2 \mathrm{Inf}_{\mathrm{it}} + \beta_3 \mathrm{Ln\_GDP}_{\mathrm{it}} + \beta_4 \mathrm{ER}_{\mathrm{it}} + \beta_5 \mathrm{Ln\_size}_{\mathrm{it}} + \beta_6 \mathrm{ETA}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (1)$$

and

$$Z - score_{it} = \beta_0 + \beta_i BI\_Rate_{it} + \beta_2 \mathrm{Inf}_{\mathrm{it}} + \beta_3 \mathrm{Ln\_GDP}_{\mathrm{it}} + \beta_4 ER_{\mathrm{it}} + \beta_5 \mathrm{Ln\_Size}_{it} + \beta_6 \mathrm{ETA}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (2)$$

where,

NPLF_{it} = Non Performing Loan or Financing for bank *i* in year *t*
Z-score_{it} = Bankruptcy risk for bank *i* in year *t*
$\mathrm{BI\_Rate}_{it}$ = BI rate for bank *i* in year *t*
Inf_{it} = Inflation rate for bank *i* in year *t*
$\mathrm{Ln\_GDP}_{it}$ = Gross Domestic Product for bank *i* in year *t*
ER_{it} = Economic growth for bank *i* in year *t*
$\mathrm{Ln\_Size}_{it}$ = Size for bank *i* in year *t*
ETA_{it} = Equity to asset ratio for bank *i* in year *t*
ε_{it} = Error-term

Regarding the measurement of the long-term relationship among variables, this study applies panel unit roots and the panel cointegration technique to estimate the effect of macroeconomic variables on risk-taking behavior in a dual banking system. To perform the panel cointegration, the assumption of the test must be applied in which all the variables have to be stationary at the first difference. As suggested by Zulkhibri et.al (2015), this test can be employed in Im, Pesaran and Shin W-stat (IPS), ADF-fisher and PP-Fisher tests. The null hypothesis for all the unit roots tests mentioned before is non stationary.

Then, the panel cointegration test may be conducted by adopting the Pedroni panel cointegration which permits for individual effects across different cross-sections utilizing a heterogeneous panel test (Pedroni, 2004). Pedroni tests consist of panel rho-statistic, panel PP-statistic and panel ADF-statistic. Moreover, Pedroni tests have the second type, in which the result of the test can be compared to the group mean of the panel test.

After the panel cointegration analysis, Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) are applied to measure the relationship of each variable. Panel data with considerable heterogeneity across individual members can be accommodated by adopting those tests (Pedroni, 2000). By adopting FMOLS and DOLS tests, serial correlation and endogeneity of the regressor are not prohibited to apply. The general model of the estimation suggested by Pedroni (2000) is as follows:

$$y_{it} = \alpha_{it} + \beta x_{it} + \mu_{it} \quad (3)$$

$$x_{it} = x_{it-1} + \varepsilon_{it} \quad (4)$$

y_i and x_i are dependent and independent variables which have cointegration for each member of the panel in which β is the cointegration vector if y_{it} cointegrated in the first difference. Moreover, α means a specific fixed effect in the cointegration relationship is allowed while ε_{it} (μ_{it}, ε_{it}) is a symbol of vector error process.

Result and Discussion

Unit root test result

As the beginning of conducting the panel cointegration test, a panel unit roots test is necessary to be applied to reveal the characteristics of the data and to ensure that all variables are stationary in the first difference (Pedroni, 2004). According to Table 2. entitled Panel Unit Root Test of Conventional and Islamic Banks, which considers individual intercept then individual intercept and trend, it shows that some variables such as Z-score and ETA are stationary at level including Ln_size based on the ADF test. Moreover, when the panel unit root in the first difference is tested, all variables are stationary at the first level. Similarly, that condition is also experienced by all variables of conventional and Islamic banks while for individual intercept and individual intercept and trend are selected. This result indicates that all variables of conventional and Islamic banks fulfill the requirement of the panel cointegration test assumption.

In Table 3, by applying individual intercept, the Z-score and ETA are stationary in the first difference even though the degree of significance is different. Furthermore, all variables are stationary at the first level. Most variables are significant in the 1% level. Based on individual intercept and trend, it exhibits that all variables are stationary at the first difference when tested by PP. The test result of conventional banks' variables indicates that it meets the assumption of cointegration to have stationarity in the first difference. For the Islamic banks' variable in Table 4, the results of the tests are mostly similar to its counterpart. Adopting individual intercept, in the first difference, all variables can reject the null hypothesis due to their stationarity, with most variables being significant in the 1% level. All variables are stationary at the first difference when individual intercept and trend is employed. Although IPM and ADF test results showed that BI Rate is not stationary at the first difference, the PP test concludes that all variable remains stationary at the first difference. According to all the tests' results, these results comply with the assumption of cointegration test to have the level stationarity at the first difference (Pedroni, 2004).

Table 2. Panel Unit Root Tests of Conventional and Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			firstDifference			At Level			firstDifference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPLF	1.15	30.4	40.8	-9.9***	170.1***	336.5***	1.53	28.5	46.2	-9.48***	155.3***	906.7***
ZSCORE	-3.24***	69.3***	71.6****	-8.80***	146.5***	368.3***	-2.38***	57.2**	83.6***	-6.01***	101.4***	899.9***
BIRATE	1.14	16.6	10.8	-3.70***	63.7***	146.1***	5.44	3.01	1.5	-1.15	36.5	104.8***
INF	0.01	24.2	56.6**	-8.79***	142.8***	408.5***	3.14	8.24	28.4	-5.93***	94.3***	332.0***
LN_GDP	0.63	19.7	23.2	-64.7***	1282.6***	331.5***	-47.68***	1450.1***	150.0***	-65.5***	4741.0***	311.0***
ER	2.12	11.8	7.78	-11.01***	182.0***	262.5***	1.36	16.6	19.7	-8.57***	132.9***	206.7***
LN_SIZE	-1.83	63.3***	85.1	-9.96***	167.5***	167.5***	0.01	38.4	63.4	-10.1***	160.4***	1159.0***
ETA	-21.7***	376.3***	445.9***	-20.7***	361.4***	557.5***	-20.7***	333.9***	919.2***	-17.9***	284.0***	1519.1***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The Null hypothesis for all tests is non-stationary in which *, ** and** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 3. Panel Unit Root Tests of Conventional Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			firstDifference			At Level			firstDifference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPLF	1.31	11.9	16.1	-7.01***	82.8***	156.5***	1.95	8.15	16.6	17.13***	79.5***	469.2***
ZSCORE	-2.26**	35.4***	31.5**	-7.63***	89.7***	198.4***	-2.07**	31.5**	50.0***	-5.96***	66.5***	712.2***
BIRATE	0.80	8.33	5.42	-2.61***	31.8**	73.0***	3.85	1.50	0.79	-0.81	18.2	52.4***
INF	0.01	12.1	28.3	-6.22***	71.4***	204.2***	2.22	4.12	14.20	-4.19***	47.1***	166.0***
LN_GDP	0.44	9.88	11.6	-45.7***	641.3***	165.7***	-33.7***	725.0***	75.0***	-46.3***	2370.5***	155.5***
ER	1.50	5.92	3.89	-7.78***	91.0***	131.2***	0.99	8.32	9.86	-6.05***	66.4***	103.3***
LN_SIZE	-0.09	23.2	48.5***	-8.66***	103.4***	177.3***	-0.91	25.50	51.4***	-8.24***	91.5***	939.3***
ETA	-18.4***	224.3***	243.0***	-15.4***	190.5***	286.6***	-17.2***	199.2***	460.7***	13.4***	150.7***	554.7***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The Null hypothesis for all tests is non-stationary in which *, ** and** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 4. Panel Unit Root Tests of Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			firstDifference			At Level			firstDifference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPLF	0.31	18.5	24.7	-7.10***	87.1***	180.0***	0.21	20.3	29.6**	-6.26***	75.6***	437.9***
Z-score	-2.32**	33.9**	40.1***	-4.80***	56.7***	172.4***	-1.28*	25.6	33.4**	-2.54***	34.9***	185.0***
BI_Rate	0.80	8.33	5.42	-2.61***	31.8690**	73.1***	3.85	1.50	0.79	-0.81	18.2	52.4***
Inf	0.01	12.1	28.3*	-6.22***	71.4***	204.2***	2.22	4.12	14.2	-4.19***	47.1***	166.0***
Ln_GDP	0.44	9.88	11.6	-45.7***	641.3***	165.7***	-33.7***	725.0***	75.0***	-46.3***	2370.5***	155.5***
ER	1.50	5.92	3.89	-7.78***	91.0***	131.2***	0.99	8.32	9.86	-6.05***	66.4***	103.3***
Ln_size	-2.53***	40.3***	47.4***	-5.28***	62.4***	141.2***	1.01	12.3	10.7	-5.95***	67.6***	234.8***
ETA	-13.4***	165.1***	207.9***	-14.4***	177.2***	271.5***	-13.3***	150.5***	371.8***	-12.3***	138.6***	839.9***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The Null hypothesis for all tests is non-stationary in which *, ** and** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 5. Cointegration Tests for All Models

Pedroni Tests	Conventional and Islamic Bank		Conventional Bank		Islamic Bank	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
			Within Dimension			
Panel v-statistic	-0.31	-2.03	-2.79	-2.31	-0.29	-0.66
Panel rho-statistic	2.14	3.18	2.08	2.00	1.53	2.63
Panel PP-statistic	-28.5***	-1.52*	-3.10***	-2.51***	-20.5***	0.14
Panel ADF-statistic	-7.17***	-3.40***	-3.09***	-2.94***	-6.21***	-0.42
			Between Dimension			
Group rho-statistic	4.13	4.28	3.30	2.71	2.69	3.43
Group PP-statistic	-17.6***	-1.59**	-1.96**	-2.61***	-8.86***	0.15
Group ADF-statistic	-4.97***	-3.37***	-1.75**	-3.22***	-5.15***	-0.83

Notes: All tests utilize Pedroni tests which have null hypothesis as no cointegration in which *, ** and** denote as significant at 1% level, significant at 5% level and significant at 10% level

Cointegration test result

As explained by Pedroni (2004), cointegration tests will delineate the long-term relationship among the variables. The null hypothesis of a cointegration test is no cointegration. Based on Table 5. entitled Cointegration Test for All Models, Model 1 for the conventional and Islamic bank indicates that NPLF has a long-term relationship to the macroeconomics factors(Lin et al., 2016)(Lin et al., 2016)(Lin et al., 2016)(Lin et al., 2016)(Lin et al., 2016)(Lin et al., 2016)(Lin et al., 2016). It can be seen from the Pedroni tests that, in these results, four out of seven tests are significant at 1% level either within dimension or between dimensions. This result also indicates that the NPL of the banks is affected by macroeconomic variables for long-term relationships (Lin et al., 2016). Bankruptcy risk denoted by Z-score in Model 2 has a similar result to NPL, which considers the Pedroni tests. Several tests such as Panel PP-statistic and Panel ADF-statistic show the significance of the cointegration test.

The cointegration relationship by the two models shows that the risk-taking behavior by the bank will correlate to macroeconomic variables like inflation, central bank interest rate, economic growth and exchange rate. The change of each macroeconomic variable may influence the risk-taking behavior of the bank (Karim et al., 2016). The conventional banks strongly affect the long-term relationship due to their asset and market share domination in the dual banking system (Alam, 2012). As the market leaders of the banking industry, conventional banks have the same long-term relationships as all banks. This result illustrates the strong influence of conventional banks to drive the banking industry in a dual banking system. For the cointegration result, four out of seven Pedroni tests in Model 1 conclude that the p-value is less than 10% as the maximum benchmark of significant level. This means that the null hypothesis is rejected and the alternative hypothesis can be taken as the conclusion that a long-term relationship between NPLF and macroeconomic variables exists, for which this result is supported by Lin et.al (2016). Model 2, which explains the relationship between bankruptcy risk and macroeconomic variables, reflects the long-term relationship among the variables. Therefore, as concluded by Karim et.al (2016), the risk-taking of conventional banks will depend on the dynamic of macroeconomic conditions. The risk management of the conventional banks must examine the macroeconomic dynamic indicators. Regarding the history of financial crises, the bankruptcy risk that haunted conventional banks experiencing financial distress conditions might start from macroeconomic turmoil (Eichler & Sobański, 2016).

For Islamic banks, the results of NPLF describe the long-term relationship with macroeconomic variables (Lin et al., 2016). The Pedroni tests of Islamic banks state that four out of seven tests are significant at 1% level. The long-term relationship between NPLF and macroeconomic variables may illustrate the characteristic financing activity performed by Islamic banks. From the supply side, Islamic banks may consider macroeconomic conditions while giving financing to debtors, where it may affect the financing program of Islamic banks (Bourkhis & Nabi, 2013). Uniquely, in model 2, Islamic banks do not have long-term relationship with macroeconomic variables. The Pedroni test results show that there is no single test which has statistical significance in any level. The result represents no long-term relationship between bankruptcy risk and macroeconomic variables. Based on this result, bankruptcy risk in Islamic banks may be affected by not only macroeconomic variables, but it may be dominated by other factors. The non-domination of macroeconomics factors may be caused by unique characteristics of Islamic banks which must comply with Sharia law, promoting equity based financing, against interest rates and any speculation in economic transactions (Sanwari & Zakaria, 2013).

Additionally, the different nature of risk-taking behavior in Islamic banks compared to conventional banks may generate different treatment of risk management on the part of the banks (Bourkhis & Nabi, 2013; Sanwari & Zakaria, 2013). Thus, a proper risk-taking management pattern may need to be found to accommodate the unique nature of Islamic banks. Islamic banks may be more robust during financial distress such as a financial crisis that may be experienced in a dual banking system. The robustness of Islamic banks may be rendered by its different risk-taking behavior, which has different sensitivity to macroeconomic factors. Surely, this characteristic of Islamic banks may require more attention from policy makers such as the central bank, in making different policies for Islamic banks due to their unique nature.

FMOLS and DOLS test result

The result of FMOLS and DOLS will reveal the relationship between two variables whether it has a positively significant relationship or vice versa. When the conventional and Islamic banks are grouped as one sample, BI_Rate has negative significance to the NPLF at 10% level. It shows that if the number of BI_Rate increases, the NPLF will decrease. This may happen due to high cost of borrowing faced by the debtors then they choose not to borrow money from the bank. This evidence assures that interest rate constitutes a crucial variable for banks (Nursechafia & Abduh, 2014). The less amount of money lent to the debtor may decrease the rate of NPLF. Moreover, the test concludes the dependent variable which also represents financial soundness has a significant relationship to the exchange rate (Karim et al., 2016).

Furthermore, this relationship indicates that a combination of sample between conventional and Islamic banks, which is dominated by conventional banks in terms of asset size, has a high exposure to exchange rate risk. The banks will be sensitive to a change of exchange rate. For example, in the Model 1 of DOLS test exhibits that an increase 1% value of exchange rate will rise 0.001% in NPLF's score. Conversely, an increase in the value of exchange rate will increase the bankruptcy risk. It is showed by in the Model 2 which represents an increase of Z-score while the value of exchange rate increase. Lin et.al (2016) argue that risk exposure may involve in foreign currency transaction where an increase in the exchange rate meaning that the local currency is depreciating which transaction cost of the bank may increase. The high involvement to foreign currency transaction will happen while the bank engages in open financial transaction including international market (Seeberg, 2015).

In terms of control variable for research Models 1 and 2, it can be seen that the financial structure of the bank is a matter observed from the asset value and the capital structure of the banks. The banks with higher asset value will have less NPLF due to their ability to manage the risk. Trad et al. (2017) explain that the big banks may have the possibility to diversify investment to create their portfolio. The excess assets of the banks may be exerted to create a considerable return with a certain level of manageable risk. This situation is illustrated by the FMOLS and DOLS test result. In Model 2, the bankruptcy risk and the bank size has a positive relationship. It implies there is less bankruptcy risk for the banks who have big assets. The higher value of Z-score highlights the lesser level of bankruptcy risk (Trad et al., 2017). The bigger size of the banks may enable it to enlarge its investment coverage to manage bankruptcy risk and make the bank resilient to financial sluggishness.

For the conventional banks as the object of the research, the NPLF has a negative relationship to the BI_Rate either in the FMOLS or DOLS test. This result shows that there is a strong correlation of BI_Rate to business activity performed by the conventional banks, which are mainly funding and lending money based on interest rate (Al Wesabi & Ahmad, 2013). Similarly, the negative relationship between those variables may be rendered by the demand point of view of the lender who may opt to "wait and see" due to the high cost of borrowing. The debtor may consider not borrowing money from the bank. Furthermore, inflation has a negative and significant relationship to the risk taking behavior of conventional banks. Zarrouk et al. (2016) state the high level of inflation may signal to the banks that the actual return generated by the banks will be less, due to the nature of inflation as a disincentive to the conventional banks' return. Therefore, banks may refrain from lending to the debtor. The negative relationship between bankruptcy risk and inflation in model 2 shows that the banks will generate more actual return while the inflation rate is low (Boyd, Levine, & Smith, 2001). Hence, the low level of inflation may enable the banks to be more sustainable in operating their business.

Table 6 . FMOLS and DOLS Result for All Banks

Variables	Conventional and Islamic Bank				Conventional Bank				Islamic Bank			
	FMOLS		DOLS		FMOLS		DOLS		FMOLS		DOLS	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Bl_Rate	-0.78*	-0.101	-0.57	-0.07	-0.27***	0.06	-9.77**	1.49*	-1.05	-0.31**	-0.84	-0.24*
	(-1.72)	(-1.40)	(-1.31)	(-0.65)	(-4.52)	(0.39)	(-2.61)	(1.83)	(-1.27)	(-2.02)	(-1.08)	(-1.66)
Inf	-0.07	0.08**	-0.13	0.007	-0.15***	0.07	0.29	-0.97*	0.02	0.09	-0.07	-0.08
	(-0.33)	(2.25)	(-0.64)	(1.29)	(-5.37)	(0.95)	(2.17)	(-1.91)	(0.05)	(1.25)	(-0.19)	(1.19)
Ln_GDP	-4.25	2.015	-2.53	1.46	-4.99***	7.88**	-7.27	55.72**	2.88	-0.84	3.17	-0.08
	(-0.38)	(1.14)	(-0.25)	(0.59)	(-3.36)	(2.03)	(-0.68)	(2.62)	(0.14)	(-0.22)	(0.17)	(-0.02)
ER	0.001**	-0.0003***	0.001**	-0.0003***	0.0005***	-0.0004**	0.0008*	-0.002**	0.002*	-0.0002	0.002**	-0.003*
	(2.27)	(-4.06)	(2.38)	(-2.74)	(8.04)	(-2.17)	(1.72)	(-2.54)	(1.92)	(-1.18)	(2.17)	(-1.75)
Ln_size	-3.27***	0.67***	-3.16**	0.74***	-2.21***	-1.59**	-4.14***	-2.77*	-5.16***	0.91***	-5.18***	1.004***
	(-3.06)	(3.96)	(-3.11)	(2.98)	(8.008)	(-2.22)	(-4.05)	(-1.91)	(-3.28)	(3.16)	(-3.49)	(3.62)
ETA	-3.27	2.93***	14.36***	2.95*	-0.65	2.33**	25.05***	-0.03	33.42***	2.75	20.40*	2.67
	(-3.06)	(2.82)	(-3.11)	(1.87)	(0.72)	(0.99)	(2.80)	(-0.006)	(2.85)	(1.28)	(1.81)	(1.26)
Adjusted R-squared	0.285	0.926	0.282	0.926	0.577	0.917	0.948	0.98	0.347	0.803	0.346	0.805

Notes: All tests utilize panel dynamic analysis tests which have null hypothesis as non-significant in which *, ** and** denote as significant at 1% level, significant at 5% level and significant at 10% level

The result of FMOLS and DOLS tests also provide evidence of the negative relationship between GDP to NPLF of conventional banks. This phenomenon defines the low level of NPLF rate while there are favorable economic conditions (Espinoza & Prasad, 2010). Therefore, the debtor is able to return the borrowed money to the conventional banks based on a pre-determined schedule. In model 2, the positive relationship between GDP and bankruptcy risk indicates that the number of Z-score will be higher while the value of the GPD is higher as well. The high Z-score represents the fact that the level of bankruptcy owned by the bank is lower. Alandejani & Asutay (2017) claim that a stable economic situation may establish the good performance of financial

institutions, for example in their operation of business activities. In terms of the relationship of exchange rate to risk-taking behavior, it is similar to the previous result when conventional and Islamic banks are grouped. This result also similarly supports the conclusions of Seeberg (2015), in that the banks may have high exposure to business activity related to exchange rate transactions. For conventional banks, the size and the capital structure of the bank will influence the performance of the bank in regard to risk taking behavior and the macroeconomic factors (Trad et al., 2017).

While the NPLF of conventional banks has a strong relationship to BI Rate, Islamic banks have no significant relationship to interest rate, which is a result also supported by Al Wesabi and Ahmad (2013). The variety of the Islamic banks' products may be the main reason why the relationship is not significant. Several products of Islamic banks are based on profit sharing such as *musharakah* and *mudarabah*, which will generate the return depending purely on the business activity (Lin et al., 2016). This kind of product, theoretically, will not have any relationship to interest rate. This finding is a signal that Islamic banks already operate funding and lending activities based on profit sharing. However, BI_Rate as the symbol of the interest rate in Indonesia has a negative and significant relationship to Z-score. This implies that an increase in interest rate will lower the Z-score, which means the possibility of going bankrupt becomes higher. This relationship may conclude that even though Islamic banks promote profit loss sharing products to the customer, Islamic banks still have limited alternatives to borrowing money while the bank has to manage liquidity asset, due to the fact that the size of Islamic banks is still low in the banking industry (Trad et al., 2017). Liquidity asset providers may come from conventional financial institutions including Islamic banks as the last resource of funding which will relate to interest rate when the bank performs lending activities.

Surprisingly, GDP does not have a significant relationship to the risk-taking behavior of Islamic banks (Karim et al., 2016), in which inflation has the same relationship. This result confirms the different conditions experienced by conventional banks in which conventional banks have a significant relationship to those two macroeconomic variables. The non-significant relationship with GDP means Islamic banks do not depend on the dynamic of GDP growth or degradation. The small size of Islamic banks may bec the main reason for this. Furthermore, this finding also confirms that the depositors of Islamic banks are still fewer compared to their counterpart. Regarding the bank characteristics, based on model 1 and 2 results show a significant relationship between NPLF and Z-score with bank size. The larger assets of the banks provide evidence of the banks' greater resilience to risk-taking behavior. This situation depicts good risk-management by the banks especially in managing risk-taking behavior due to their ability to create good stability and a good investment portfolio as part of the risk management instrument. This finding aligns with several studies by Louhichi & Boujelbene (2016), Xiong, Ibbotson, Idzorek, & Chen (2010), and Megginson (2005) that support the results of this study.

Conclusion

According to the results and discussion mentioned above, risk-taking behavior of conventional and Islamic banks has a long running relationship with macroeconomic variables. This result provides the insight for both banks that macroeconomic variables are some of the key factors which will determine the risk faced by the banks. However, conventional banks and Islamic banks have different responses to macroeconomic variables. Conventional banks have more exposure to interest rate compared to Islamic banks. This evidence shows that conventional and Islamic banks have a different nature in their business operations. Conventional banks tend to adopt interest rate as the benchmark to generate their returns, while Islamic banks prefer to apply profit loss sharing which is mainly performed in equity based financing such as *musharakah* and *mudharabah*. Furthermore, the non-significant relationship between risk-taking behavior in Islamic banks and GDP shows that the customers of Islamic banks are still fewer compared to their counterpart.

Finally, as the policy makers, the financial authorities in the dual banking system such as the central bank and financial service authority must pay attention to these different characteristics of the two kinds of banks. Hence, policy makers may not treat both banks equally. A different policy must be applied due to the different characteristics of each bank. Specific for the Islamic banks, policy makers may provide incentive for Islamic banks to spur more impressive development through the easing of rules for Islamic banks and by providing an Islamic banking industry ecosystem to make sure that the Islamic banks can comply with Sharia and remain competitive in the banking industry. For all banks, the policy makers may encourage the banks to increase their bank size due to the fact that large banks will make it easier to manage risk-taking behavior. Also, policy makers may recommend the banks to merge with the intention of promoting their resilience in facing turmoil from macroeconomics factors.

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